Central Manchester Haematology Service

User Guide – December 2014

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About Us

The laboratory offers a comprehensive test repertoire for neonatal, paediatric and adult haematological investigation and treatment of patients including: Blood Counts, Coagulation, Red Cell and Haematinic Investigations, Molecular Diagnostics, Stem Cell Therapeutics and Blood Transfusion services.

We aim to provide a user-responsive service with rapid turn around of accurate results. Expert clinical and scientific advice is available on the investigation of haematological disorders, the interpretation of test results, and on any further investigations which may be required.

Location

The laboratory is situated in the Manchester Royal Infirmary and is part of the Central Manchester University Hospitals NHS Foundation Trust (CMFT), within the Clinical Science Buildings.

For a full map of the hospital site please click on this link:

or if you have a paper copy type the following into your browser:

http://intranet.cmht.nwest.nhs.uk/directorates/HSA/pdf/Manchester%20Hosps%20Inside%20Aug.09.pdf

Postal address

Department of Haematology
Directorate of Laboratory Medicine
1st Floor Cobbett House
Manchester Royal Infirmary
Oxford Road
Manchester
M13 9WL

Working hours

The laboratory is open for routine services Monday – Friday 08:30 to 17:15
The Out-of-Hours service covers the remainder of the 24 hour period, weekends and Bank holidays for urgent, emergency work and some specialised work where required.

Quality Statement

The investigations performed within the CPA accredited laboratory are recognised standards of practice. Documentation relating to internal quality control and quality assurance are retained for scrutiny by users of the Service. The department

participates in all appropriate national external quality assurance schemes (NEQAS) where available.

Accreditation

The Haematology Department is accredited by Clinical Pathology Accreditation UK (CPA UK), we are an accredited training laboratory for the Institute of Biomedical Sciences (IBMS) and our qualified biomedical scientists are registered with the Health Professions Council (HPC).

The Blood Transfusion service conforms to the Blood and Safety Quality Regulations and is certified as such by the Medicines and Health Regulatory Agency (MHRA). Our Stem Cell Therapeutics facility are both JACIE and HTA accredited.

CPA Accredited Medical Laboratory
Reference No: 0862

Services Available

The department participates in the Directorate of Laboratory Medicine User Satisfaction Survey and also in Clinical Liaison meetings with our users. We are always willing to meet with our users to discuss their needs and issues. If you have any comments on the services that we provide or would like to discuss new services you would wish to see developed please contact the Laboratory Manager or Head of Service by telephone, letter or e-mail.

Scope of Service

The range of haematology tests offered, together with the specimens required, are described in the list of tests.

Specimen Acceptance Policy

The Directorate of Laboratory Medicine has a Specimen Acceptance Policy. A copy of the Directorate Specimen Acceptance policy is included in the DLM handbook obtained from the Client Services Office, CSB1

Blood Transfusion operates a ‘Zero tolerance Policy.’ Specimen and request labeling guidelines are included in the Trust Transfusion Policy.

Consultant and Management Staff Contact Details

Haematology Management Team

Title: Head of Scientific Services
Name: Dr John Ardern
Tel: 0161 276 4076
e-mail: john.ardern@cmft.nhs.uk

Title: Laboratory Manager
Name: Claire Whitehead
Tel: 0161 276 4421
e-mail: claire.whitehead@cmft.nhs.uk

Title: Lead BMS Blood Transfusion, Stem Cell Therapeutics and Paediatrics
Name: Roy Kettle
Tel: 0161 276 8599
e-mail: roy.kettle@cmft.nhs.uk

Haematology Clinical Team

Title: Hematology Clinical Director
Name: Dr. Kate Ryan
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e-mail: kate.ryan@cmft.nhs.uk

Title: Paediatric Hematology Clinical Director
Name: Dr. Andrew Will
Tel: 0161 701 8416
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Senior Laboratory Staff

Title: Chief Biomedical Scientist Blood Counts
Name: Michelle Brereton
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Title: Chief Biomedical Scientist Coagulation
Name: Lynne Keighley
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Title: Chief Biomedical Scientist Red Cell Laboratory
Name: Simone McLaughlin
Tel: 0161 701 0146
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Title: Chief Biomedical Scientist Blood Transfusion
Name: Jane Uttley
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Title: Chief Biomedical Scientist Stem Cell Therapeutics
Name: Wendy Ogden
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Blood Transfusion Team

Title: Lead Blood Transfusion Practitioner
Name: Mary Marsden
Tel: 0161 276 8041
e-mail: mary.marsden@cmft.nhs.uk

Title: Senior Blood Transfusion Practitioner
Name: Carmel Parker
Tel: 0161 901 1961
e-mail: carmel.parker@cmft.nhs.uk

Title: Senior Blood Transfusion Practitioner
Name: Louise Polyzois
Tel: 0161 901 1961
e-mail: louise.polyzois@cmft.nhs.uk

Molecular Diagnostics Centre Team (genetic investigations)

Title: Consultant Clinical Scientist, Molecular Diagnostics Centre
Name: Dr Tony Cumming
Tel: 0161 276 4880 / 4809
e-mail: tony.cumming@cmft.nhs.uk

Title: Principal Clinical Scientist, Haemostasis and Thrombosis & Haemoglobinopathies
Name: Dr Steve Keeney
Tel: 0161 276 5990 / 4809
e-mail: steve.keeney@cmft.nhs.uk

Title: Principal Clinical Scientist, Molecular Oncology
Name: Dr Abida Awan
Tel: 0161 276 4137 / 4809
e-mail: abida.awan@cmft.nhs.uk

Haematology Administration

Title: Information Lead
Name: Hannah Belli

Tel: **0161 276 8980**

e-mail: **Hannah.Belli@cmft.nhs.uk**

Departmental Fax: **0161 276 8089**

Central Sample Reception

Title: **Central Specimen Reception Manager**

Name: **Rebecca Whitehouse**

Tel: **0161 276 4692**

e-mail: **Rebecca.whitehouse@cmft.nhs.uk**

Title: **Client Services Manager**

Name: **Colette McAlister**

Tel: **0161 2764062**

e-mail: **Colette.mcalister@cmft.nhs.uk**

Results Hotline **Tel:** **0161 2768766**

Haematology Tests

Guidelines to availability of Tests

The results availability times given below represent the time generally required to produce a result following receipt of the sample in the laboratory. Sample transport times are not included. Where appropriate, if a result is required the same day samples must be received sufficiently early to allow completion of the test. Please contact the lab if the test you require is not listed below.

The tests below are available during the normal working day. A list of haematology/transfusion tests provided outside core hours is given after the list of all tests available.

Blood Counts

BLOOD COUNTS				
Test	**Specimen(s)**	**Result(s) available* Urgent**	**Non-urgent**	**Report(s) Available**
Full blood count and automated differential	1 x 4ml purple cap EDTA [1x 2ml EDTA[1]] [1x 0.5ml EDTA[1]]	1 hr	4 hr	24 hr
Manual blood film [(2)]	Any of the above specimen types	by arrangement	24 hr	24hr
Reticulocyte count	Any of the above (from FBC sample)	1 hr	4 hr	24 hr
Erthrocyte Sedimentation Rate (ESR)	1x 4ml purple cap EDTA (1x 2ml EDTA - paediatric) (from FBC sample)	1.5 hr	4 hr	24 hr
Screening test for glandular fever	1 x 4ml Dark Purple (from FBC sample)	30 min	Same day	24hr
CSF	1ml sample in plastic universal	2 hr	6 hr	24 hr
Bone marrow report[2]	4 slides + 1 x 3 ml EDTA	by arrangement	7 days	7 days
Detection of malarial parasites [(2)]	From full blood count specimen	2 hr by arrangement	N/A	24 hr
Plasma Viscosity	1 x 4ml purple cap EDTA [1x 2ml EDTA[1]]	1 hr	8 hr	24 hr

N/A = not applicable [1] Paediatric samples [2] Please ring lab (Ext 64030)
From time of receipt in the laboratory

FOR FURTHER ADVICE AND INFORMATION TELEPHONE 0161 276 64030 OR 64032

Coagulation

COAGULATION				
Test	**Specimen(s)**	**Result(s) available* Urgent**	**Non-urgent**	**Report(s) Available**
APTT	Blue cap vacutainer [1.3ml, 2ml or 5ml Paed bottle]	60 min	3 hr	24 hours
Prothrombin time	As above	60 min	3 hr	24 hours
FDP D-Dimers	Blue cap vacutainer [1.3ml, 2ml or 5ml Paed bottle]	60 min	3 hr	24 hours
Fibrinogen	As above	60 min	3hr	24 hours
Bleeding time	Test carried out on patient (contact lab ext. 12123)	by arrangement	by arrangement	24 hours

Anticoagulant Control				
Test	**Specimen(s)**	**Result(s) available* Urgent**	**Non-urgent**	**Report(s) Available**
Heparin control	Blue cap vacutainer [1.3ml, 2ml or 5ml Paed bottle]	60 min	3 hr	24 hours
Oral Anticoagulant Control (INR)	As above	60 min	3 hr	24 hours

Coagulation Factor Assays				
Test	**Specimen(s)**	**Result(s) available* Urgent**	**Non-urgent**	**Report(s) Available**
Factor II assay	Blue cap vacutainer [1.3ml, 2ml or 5ml Paed bottle]	3hr	< 10 days	< 10 days
Factor V assay	Blue cap vacutainer [1.3ml, 2ml or 5ml Paed bottle]	3 hr	< 10 days	<10 days
Factor VII assay	As above	3 hr	< 10 days	< 10 days
Factor VIII assay	As above	3 hr	< 5 days	< 5 days
Factor IX assay	As above	3 hr	< 5 days	< 5 days
Factor X assay	As above	3 hr	< 10 days	< 10 days
Factor XI assay	As above	3 hr	< 10 days	< 10 days
Factor XII assay	As above	3 hr	< 10 days	< 10 days
Factor VIII inhibitors	As above	3 hr	< 1month	< <1 month
Factor IX inhibitors	As above	3 hr	< <1 month	< <1 month
Platelets Aggregation Studies	Contact Lab - 12123	Same day by arrangement	by arrangement	< 5 days
von Willebrand factor activity	Blue cap vacutainer [2x1.3ml, 2ml or 5ml Paed bottle]	3 hr	< 1 month	< 1 month
von Willebrand factor multimers	Contact Lab – 64809 (Molecular Diagnostic Centre)	-	4-5 wks	4-5 wks
von Willebrand Factor	Blue cap vacutainer [2x1.3ml, 2ml or 5ml Paed bottle]	3hr	< 1 month	< 1 month
Ristocetin induced platelet aggregation (RIPA)	Contact Lab – 12123	Same day	by arrangement	<5 days

Thrombophilia Assays				
Test	**Specimen(s)**	**Result(s) available* Urgent**	**Non-urgent**	**Report(s) Available**
Antithrombin	Blue cap vacutainer [2x1.3ml, 2ml or 5ml Paed bottle]	3 hr	< 1 month	< 1 month
Factor V Leiden Mutation screen[1]	Blue cap vacutainer	-	<14 days	<14 days
Prothrombin G20210A Mutation screen[1]	Blue cap vacutainer	-	<14 days	<14 days
Lupus anticoagulant	2X blue capped vacutainer [3x1.3ml,2x2ml or 5ml Paed bottle]	by arrangement	<2 wks	<2 wks
Protein C	Blue cap vacutainer [3x1.3ml,2x2ml or 5ml Paed bottle]	3 hr	< 1 month	< 1 month
Protein S	As above	3 hr	< 1 month	< 1 month

[1] See Molecular Diagnostics Centre section for further information

***** From time of receipt in the laboratory

FOR FURTHER ADVICE OR INFORMATION - TELEPHONE 0161 276 4030

Blood Transfusion

BLOOD TRANSFUSION				
Test	**Specimen(s)**	**Result(s) available*** **Urgent**	**Non-urgent**	**Report(s) Available**
Cross matching	Adult 7 ml EDTA pink cap Paediatric 2ml edta red top Neonatal 1.3ml edta red top	45-60 min	4 hr Non urgent cross-matching can take from 2 hours or longer depending on the workload priorities at that time.	N/A
Blood group	Adult 7 ml EDTA pink cap paediatric 2ml edta red top	10 min	Within 24 hrs	24 hr
Antibody screen and save serum	Adult 7 ml EDTA pink cap paediatric 2ml edta red top	30 min	Within 24 hrs	24 hr
Cord blood Investigations	7 ml EDTA pink cap (maternal) 7ml EDTA pink cap (cord)	2 hours	Within 24 hrs	24 hr
Kleihauer test	7ml EDTA pink cap	60 min	Within 24 hrs	24 hr
Direct Antiglobulin Test	7 ml EDTA pink cap	20 min	Within 24 hrs	24 hr
Haptoglobulin Estimation	7 ml clotted red cap	N/A	Within 10 days	10 days
Cold agglutinin titres ($4^{o}C$)	7ml EDTA pink cap (kept at $37^{0}C$) by prior arrangement with the laboratory only	N/A	48 hr	48 hr
Haemolysins	7 ml EDTA pink cap	4 hours	24 hr	24 hr
Antibody titre	7 ml EDTA pink cap	N/A	NBS 5 working days	NBS 5 working days

N/A = not applicable * From time of receipt in the laboratory

FOR FURTHER ADVICE OR INFORMATION, TELEPHONE 0161 276 4400 or 64887
URGENT REQUESTS FOR BLOOD TRANSFUSION 0161 276 4400

Haematinics

HAEMATINICS				
Test	**Specimen(s)**	**Result(s) available* Urgent**	**Non-urgent**	**Report(s) Available**
Serum and red cell folate	1 x 4ml purple cap EDTA 1 x 7 ml red cap clotted	N/A	3 working days	5 days
Serum vitamin B12	1 x 7 ml clotted	N/A	3 working days	5 days
Serum ferritin	1 x 7 ml clotted	N/A	3 working days	5 days
Serum intrinisic factor antibodies[1]	1 x 7 ml clotted	N/A	5 working days	7 days
Erythropoietin (EPO)	1 x 7 ml clotted	N/A	5 working days	7 days
Haemochromatosis[2] C282Y, H63D and S65C genotyping	Blue cap vacutainer	-	<3 weeks	< 3 weeks
Zinc Protoporphyrin (ZPP) Paediatric only	1 x 4ml purple cap EDTA	NA	3 working days	5 days

In vivo radiosotope studies carried out by the Department of Nuclear Medicine:-

Blood volume Red cell survival	Telephone 0161 276 4820 to arrange in vivo studies

N/A = not applicable

* from time of receipt in the laboratory

[1]Serum intrinsic factor antibodies are carried out on patients with a low B12 level (less than 120ng/l)

[2] See Molecular Diagnostics Centre section for further information

FOR FURTHER ADVICE OR INFORMATION, TELEPHONE 0161 276 4689 or 64803

Haemolytics

HAEMOLYTICS				
Test	**Specimen(s)**	**Result(s) available***		**Report(s) Available**
		Urgent[1]	**Non-urgent**	
Urgent/pre-operative HbS screening test (Pts > 1 yr old)	1 x 4ml EDTA	30 min	24 hr	10-14 workdays
Routine Haemoglobinopathy Screening	1 x 4ml EDTA	N/A	10 workdays	10 -14 workdays
Universal Antenatal Haemoglobinopathy Screening	1 x 4ml EDTA	Provisional report: 3 workdays	5 workdays	7 workdays
[3]DNA Testing for the Haemoglobinopathies	4 x 4ml EDTA	N/A	N/A	N/A
G6PD Screen	1 x 4ml EDTA	[1/2]Within 4 hours	3 workdays	5 workdays
G6PD Assay (if screen gives intermediate or reduced result)	1 x 4ml EDTA	N/A	3 workdays	5 workdays

N/A = not applicable

* From time of receipt in the laboratory

[1] **INFORM THE LABORATORY IF A TEST IS TO BE PERFORMED URGENTLY**

[2]Telephone laboratory, samples screened on Fridays by arrangement with laboratory

[3]North-West Genetic Diagnostic Service for Haemoglobinopathy

All requests for genetic diagnosis in haemoglobinopathy which are approved under the **NW SHA Indications for Genetic Diagnosis of Haemoglobinopathies** algorithm are centrally funded. Please see www.tinyurl.com/haemoglobinopathyreferral for associated forms and guidance.

For haemoglobinopathy genetic studies contact Dr Keeney, Molecular Diagnostics Centre 0161 276 4809.

For Red Cell Haemolytic Screen contact laboratory on 0161 276 4689

FOR FURTHER ADVICE OR INFORMATION, TELEPHONE 0161 276 4689

Molecular Diagnostics

Non-Malignant Haematology

Investigation	Blood sample requirement	Result / report available
Heritable Thrombophilia Factor V Leiden and Prothrombin G20210A mutation screen	3 mls EDTA-or citrate-anticoagulated blood	<2 weeks
Hereditary Haemochromatosis *HFE* gene mutation identification (C282Y / H63D / S65C)	3 mls EDTA-or citrate-anticoagulated blood	<3 weeks
Haemophilia A and B, FVII & FXI deficiency *F7 / F8 / F9 / F11* gene mutation identification, haemophilia carrier and prenatal diagnosis	Please contact laboratory directly	<6 weeks (prenatal diagnosis <2 weeks)
von Willebrand disease Molecular diagnosis, prenatal diagnosis in type 3 VWD	Please contact laboratory directly	<6 weeks (prenatal diagnosis <2 weeks)
Haemoglobinopathy Alpha- and beta-thalassaemia mutation identification	Please contact laboratory directly. Necessary referral information can be found at www.tinyurl.com/haemoglobinopathyreferral	<6 weeks

Contact details:
Laboratory Enquiries – 0161 276 4809
Clinical Scientific Diagnostic advice and results interpretation - Dr Tony Cumming/Dr Steve Keeney, 0161 276 4880/4809

Haemato-Oncology

Investigation	Blood sample requirement	Result / report available
Leukaemia (quantitative): ▪ BCR/ABL t(9;22) ▪ AML1/ETO t(8;21) ▪ INVERSION 16 ▪ PML/RARA t(15;17) ▪ NPM1 mutation screening for risk stratification of diagnostic AML ▪ FLT3-ITD detection for risk stratification of diagnostic AMLs in a research setting (qualitative)	15-20 mls EDTA-anticoagulated peripheral blood or 2-3 mls EDTA-anticoagulated bone marrow - *please see "molecular oncology sample requirements" below*	3 weeks 2 weeks 2 weeks 2 weeks 2 weeks 2 weeks
Myeloproliferative Disorders (MPDs) ▪ JAK2 V617F mutation screening (qualitative) ▪ JAK2 V617F allelic load quantitation ▪ MPL W515L/K mutation analysis (qualitative)	10-20 mls EDTA-anticoagulated peripheral blood or 2-3 mls EDTA-anticoagulated bone marrow - *please see "molecular oncology sample requirements" below*	3 weeks
Lymphoma Immunoglobulin and T cell receptor clonality analysis	*please see "molecular oncology sample requirements" below*	10 working days
Test under development: • BCR-ABL kinase domain mutation analysis • D816V KIT mutation analysis in mastocytosis and AML • JAK2 Exon 12 mutation analysis in MPDs • CALR Mutation Screen in MPDs	Contact laboratory for progress update	

Molecular oncology sample requirements

For quantitative real-time PCR tests, peripheral blood (PB) is routinely monitored for BCR-ABL in CML samples, with occasional bone marrow samples (BM) as required by the clinician. For BCR-ABL monitoring in ALL patients, monitoring of PML-RARA, Inv 16, AML1 ETO and NPM1 in AML patients, paired PB and BM samples are required to accurately determine levels of minimal residual disease (MRD). This is because there can be large differences in the interpretation of the relapse risk if you are looking at leukaemic gene expression in PB or BM. For this reason, it is important to identify the sample type (PB or BM) on the requisition form or request card. The accurate monitoring of MRD requires the samples to be fresh, to reach us ideally within 24 hours of phlebotomy and no later than 48 hours. This has a big effect on the

reliability of the result with large inaccuracies in quantitation levels beyond 48 hours (this is as important as the amount of sample required).

JAK 2 service
For JAK2 tests, *10ml EDTA peripheral blood is required and not a bone marrow sample.* If both a BCR-ABL and JAK2 test are required, then 10ml EDTA PB must be sent for each test.

Lymphoma service
The current service provision for the assessment of clonality in putative cases of Lymphoma predominantly tests DNA extracted from FFPE tissue. Blocks should be sent to the appropriate histopathology laboratory to be cut for PCR analysis to be performed in the MDC laboratory. The block should be examined for the location of the biopsy tissue and 5x10µm and 3x10µm should be cut and sent to the laboratory. Clonality analysis can also be performed on PB and BM, the requirements are 10-20ml PB in EDTA and/or 2-3ml BM in EDTA.

Contact details:
Laboratory Enquiries – 0161 276 4809
Clinical Scientific Diagnostic advice and results interpretation - Dr Abida Awan, 0161 276 4137

Stem Cell Therapeutics

Stem Cell Therapeutics	
Stem Cell Procurement, Processing and Cryopreservation	Contact 0161 276 4078/0161 701 1248

The laboratory is open for routine services Monday – Friday 09:00 to 17:15

Leukaemia Cell Biology

Leukaemia Cell Biology	
Research laboratory	Contact 0161 276 8042

Haematology tests available outside core working hours

- Full blood count, Auto differential and platelet count
- Sickle test
- Malarial parasites (Screening kit and Film)
- ESR
- Prothrombin time / INR
- APTT/RATIO
- Factor assays when authorised by a consultant haematologist.
- D – dimer (FDP)
- Fibrinogen
- Crossmatch
- Blood Group
- Direct Coombs Test
- Blood product issue
- Gandular fever screen
- Reticulocytes
- Specialised tests following discussion with on duty haematologist and duty BMS staff

Reference Ranges

Blood

Counts

	Birth (Term)	2-14 days	15-30 days	1-3 month	3 -12 months	1-6 years	6-12 years	12-18 years (female)	12-18 years (male)	18-150 Female	18 - 150 Male
RBC	3.7 - 6.5	3.9 - 6.0	3.3 - 6.0	3.1 - 4.5	3.8 - 4.9	3.9 - 5.1	3.9 - 5.2	4.1 - 5.1	4.2 - 5.5	3.8-5.5	4.5-6.0
x10^12/L											
Hb	149 - 237	134 - 205	110 - 180	94 - 130	100-130	101-138	111-147	121-151	121-166	115-165	130-180
g/L											
Hct	0.47-0.75	0.41-0.68	0.3-0.5	0.28-0.42	0.30-0.38	0.3-0.4	0.32-0.43	0.35-0.44	0.35-0.49	0.37-0.47	0.4-0.52
L/L											
MCV	100-130	95-120	90-105	84-98	73-95	73-88	77-91	78-95	78-95	80-98	80-98
fL											
MCH	32.0-39.0	30.0 - 40.0	30.0-36.0	27.5-34.0	23.0 - 31.5	24.0 - 30.0	24.0 - 30.0	26.0 - 32.0	26.0 - 32.0	27.0-33.0	27.0-33.0
pg											
MCHC	300 - 360	300 - 365	300 - 360	300 - 350	330 - 360	310 - 350	310 - 350	310 - 360	310 - 360	320-365	320-365
g/L											
WBC	6.0 - 26.0	6.0 - 21.0	5.0 - 20.0	5.0 - 17.0	6.0 - 17.0	6.0 - 17.0	4.5 - 14.5	4.5 - 13.0	4.5 - 13.0	4.0-11.0	4.0-11.0
x10^9/L											
Neuts	2.7 - 14.4	1.5 - 10.0	1.0 - 9.0	1.0 - 8.0	1.0 - 6.0	1.0 - 8.5	1.5 - 8.0	1.5 - 6.0	1.5 - 6.0	1.8-7.5	1.8-7.5
x10^9/L											
Lymphs	2.0 - 7.3	2.8 - 9.1	2.8 - 10.0	3.3 - 10.3	3.3 - 11.5	1.8 - 10.5	1.5 - 5.0	1.5 - 4.5	1.5 - 4.5	1.0-4.0	1.0-4.0
x10^9/L											
Monos	0.1 - 2.5	0.1 - 2.0	0.1 - 1.5	0.2 - 1.5	0.2 - 1.3	0.1 - 1.3	0.1 - 1.3	0.1 - 1.3	0.1 - 1.3	0.2-1.0	0.2-1.0
x10^9/L											
Eos	0.0 - 0.9	0.0 - 0.9	0.0 - 0.9	0.02 - 0.9	0.05 - 1.1	0.05 - 1.1	0.05 - 1.0	0.05 - 0.8	0.05 - 0.8	0.0-0.4	0.0-0.4
x10^9/L											
Baso	0.0 - 0.1	0.0 - 0.1	0.0 0.1	0.02 - 0.13	0.02 - 0.2	0.02 - 0.13	0.02 - 0.12	0.02 - 0.12	0.02 - 0.12	0.0-0.1	0.0-0.1
x10^9/L											
Plats	150 - 450	150 - 500	150 - 600	150 - 650	150 - 560	150 -550	150 - 450	150 - 430	150 - 430	150-400	150-400
x10^9/L											
Ret %	2.0 - 6.0	2.0 - 6.0	1.0 - 3.0	0.2 - 2.0	0.2 - 2.0	0.2 - 2.0	0.2 - 2.0	0.2 - 2.0	0.2 - 2.0	0.5-1.5	0.5-1.5
Ret Abs	80 - 360	80 - 360	33 - 180	6 - 100	7 - 105	8 - 105	8 - 105	8 - 110	8 - 110	20-80	20-80
x10^9/L											
RDW-CV										11.0-14.8	11.0-14.8
%											
IPF										0-6	0-6
%											

FBC Reference Ranges 2009 Central Manchester University Hospitals NHS Foundation Trust. (Hb updated to g/L March 2013). Pathology Harmony October 2014

Reference: Paediatric Haematology, Chapter 37, Third Edition: Simpkin and Hinchliffe. Adapted for Sysmex XE Analysers

Plasma Viscosity (At 25°C)

From 3 years	1.45 – 1.80 cp (Centipoise)

Coagulation

Activated Partial Thromboplastin Time (APTT)	24.6 – 34.9 secs
Antithrombin	82 – 133 u/dl
Bleeding time	2 - 8 mins
Factor II	78-130 u/dl
Factor V	65-140 u/dl
Factor VII	65-160 u/dl
Factor VIII	50-170 u/dl
Factor IX	60-160 u/dl
Factor X	70-140 u/dl
Factor XI	60-140 u/dl
Factor XII	55-160 u/dl
Fibrinogen	1.82 - 4.5 g/l
D-DIMER (FDP)	<250 ng /ml
LMWHeparin(Xa) (approx. therapeutic range)	0.30-0.70 u/ml
Prothrombin time	12.5-15.3 secs
Protein C (Chromogenic)	69 - 154 u/dl
Protein S (free)	61 – 167 u/dl
Thrombin Time	14.8-19.2 secs
Von Willebrand Factor Antigen (VWF:AG)	50 – 154 u/dl
Von Willebrand Factor Activity (Ristocetin Co-factor)	50 - 150 u/dl

N.B
For childrens or neonate reference ranges please ring laboratory – 701 2123

For significantly abnormal results suggest discussion with Haematology Consultant or Senior Registrar.
Adult - Haemostasis SPR bleep number 2022.
Paediatrics – ask switch to page Dr Will or Dr Grainger.

If you are unable to reach any ward/department with significantly abnormal results which require immediate action please bleep the Lead Nurse on 2677.

ISTH DIC scoring system

The ISTH group produced a simple scoring system for the diagnosis of DIC depending on the Platelet count, the PT, the fibrinogen level and critically the FDP/D-Dimer results:

PARAMETER	RESULT	SCORE
1. Platelet count	>100x10^9/l	0
	<100x10^9/l	1
	< 50x10^9/l	2
2. PT	<3s prolonged	0
	>3s but <6s	1
	>6s	2
3. Fibrinogen	>1.0g/l	0
	<1.0g/l	1
4. FDP/D-Dimer	No increase	0
	Moderate increase	2 (250-5000)
	Strong increase	3 (>5000)

A total score of ≥5 = DIC as long as the score is associated with a clinical disorder known to cause DIC. If the score is ≥5 you must ring the ward/medic and make them aware of the risk of DIC.

Guidance Note: D-dimer testing in the diagnosis of venous thromboembolism (VTE) in hospital patients

- VTE is highly unlikely in patients who are judged by means of a clinical scoring system to be clinically unlikely to have VTE, and who have a negative D-dimer test.
- D-dimer testing has very limited usefulness to aid diagnosis in patients where the clinical probability of VTE is high.
- D-dimer is frequently raised in hospital inpatients without VTE.
- D-dimer is increased in infection, cancer, inflammation, surgery, trauma, ischaemic heart disease, stroke, pregnancy, sickle cell disease & trait.
- D-dimer testing is not useful in the diagnosis of VTE in patients with concomitant diseases.
- There is a decrease in the specificity of D-dimer testing for VTE with increasing age (ie D-dimer testing is less reliable in older patients).
- D-dimer should not be used to exclude VTE in children. The negative predictive value of D-dimer in children with suspected VTE has not been validated and levels may vary with age.

Guidance

- D-dimer testing should only be requested in patients with a low clinical probability of VTE, or in the assessment of recurrence risk for VTE post completion of anticoagulant therapy.
- In patients with a high clinical probability of VTE, or in patients with co-existing illness, D-dimer testing is unlikely to add any useful diagnostic value and should not be requested.

Reference

Thacil J et al, Appropriate use of D-dimer in hospital patients. *Am J Med* 2010, 123, 17-9.

Guidance on Laboratory testing for Heritable Thrombophilia is available to view on the Trust intranet

Detailed information and guidance on "Thromboprophylaxis in Pregnancy and the Puerperium" is available on the Intranet in the maternity section of Staffnet Policies: http://staffnet.cmft.nhs.uk/Policies/Default.aspx

Warfarin Scheme

WARFARIN SCHEME				
DAY	**APTT (9-10am) Target**	**Heparin Dose**	**IF INR**	**Warfarin dose given at 5.00pm**
1 Start	2-3 ratio	As per APTT	< 1.4	10 mg
2		As per APTT	< 1.8	10 mg
			1.8	1 mg
			> 1.8	0.5 mg
3	2-3 ratio	As per APTT	< 2.0	10 mg
			2.0-2.3	5 mg
			2.4-2.7	4 mg
			2.8-3.1	3 mg
			3.2-3.4	2 mg
			3.5-4.0	1 mg
			> 4.0	NIL
4		Stop Heparin		Predicted Maintenance
				>8 mg
			<1.4	8 mg
			1.4	7.5.mg
			1.5	7 mg
			1.6-1.7	6.5 mg
			1.8	6 mg
			1.9	5.5 mg
			2.0-2.1	5 mg
			2.2-2.3	4.5 mg
			2.4-2.6	4 mg
			2.7-3.0	3.5 mg
			3.1-3.5	3 mg
			3.6-4.0	
				Nil then 2mg
			4.1-4.5	
			>4.5	Nil for two days and then 1 mg

Guidelines for Heparin Dosage for Heparinization for Thrombotic Conditions

GUIDELINES FOR HEPARIN DOSAGE FOR HEPARINIZATION FOR THROMBOTIC CONDITIONS			
Take baseline PT APTT Give 5,000 i.v. bolus then start pump at 30,000 units over 24 hrs (eg 30,000 units in 24 mls of N Saline and set pump at 1ml per hour) Repeat APTT after 6 hrs			
	Bolus	**Rate**	**Repeat APTT**
APTT Ratio <1.5	5,000	+2,500 units over 24 hrs	6hr-12hr
APTT Ratio 1.5-2.0	Nil	+2,500 units over 24 hrs	6hr-12hr
APTT ratio 2.0-3.0	Nil	Same dose	Next Morning
APTT Ratio 3.0-3.5	Nil	-2,500 units over 24 hrs	Next Morning
APTT Ratio 3.5-4.0	Nil	Stop for 1 hr then -2,500 units over 24 hrs	6hr-12hr
APTT Ratio >4.0	Nil	Stop for 2hr then -5,000 units over 24 hrs	6hr-12hr

	For S.C.Heparin 250 iu/kg b.d. [200 for females > 60yrs] Take specimen 4-6hrs post injection	
APTT RATIO	**DOSE ADJUSTMENT**	**REPEAT APTT**
<1.5	+2,500 units b.d	Next Morning
1.5-2.0	+1.250 units b.d.	Next Morning
2.0-3.0	No change	Next Morning
3.0-3.5	-1,250 units b.d.	Next Morning
3.0-4.0	-2,500 units b.d	Next Morning
>4.0	-5,000 units b.d	Next Morning

Haematinics

Serum folate		3.0 - 16 µg / l
Red cell folate		200 - 600 µg / l
Serum vitamin B12		150 - 900 ng / l
Serum ferritin	Male	15 - 200 µg / l
	Female	7 - 90 µg / l
Erythropoeitin (EPO)		3-18 mIU/mL
Zinc Protoporphyrin (ZPP) Paediatric only		30-80 µmolZPP/mol heam

Haemolytics

Haemoglobin A2		2.3 - 3.3 %
Haemoglobin F		< 1.5 %
G6PD		4.8 -13.6 ug/l
		8.3 – 20.1 ug/l 0-9 months

Factors Affecting the Results or Processing of Haematology Tests

Test	Factor Affecting Result/Processing	Outcome
ALL SECTIONS OF HAEMATOLOGY		
All Tests	• Failed Specimen Acceptance Policy (Routine samples and Blood Transfusion samples)	• Would not process
	• Unlabelled	• Would not process
	• Wrong sample for requested test	• Would not process
	• Wrongly labelled	• Would not process
	• Sample leaked in transit	• Would not process (If multiple samples were put in the specimen bag **ALL** samples would not be processed)
	• Sample broke in transit	• Would not process (If multiple samples were put in the specimen bag **ALL** samples would not be processed)
COAGULATION		
Routine clotting tests	Under filled sample	• Would not process
Routine clotting tests	Haemolysis	• Would process Depending on the degree of haemolysis an estimated result may be reported off the analyser with a comment '? Validity of result due to haemolysis'
Routine clotting tests	Lipaemia	• Would process Depending on the degree of lipaemia an estimated result may be reported off the analyser with a comment '? Validity of result due to lipaemia'
All clotting tests	Clotted	• Would not process
Clotting assays	Secondary clot in frozen sample	• Depending on size of clot would process and add comment '? Validity due to secondary clot' or would not process and add comment 'Clotted'

BLOOD COUNTS		
FBC	Small sample	• Paediatric- would process if there is greater that 100ul- otherwise comment 'Insufficient' Adult – would process if blood volume is sufficient to reach the bottom of the label- otherwise comment' Insufficient'
FBC & ESR	Small sample	• Paediatric – separate sample ESR.. • FBC + ESR requires 2ml in FBC tube otherwise will be reported as 'Insufficient'
FBC &Film	Old Sample (Greater than 48 hours)	• FBC would not be processed and comment-'Too old for analysis' • Film would be reported as –'Too old for morphology'
FBC, ESR & Retic	Clotted Sample	• Would not be processed
FBC	EDTA may cause clumping of platelets	• This would result in a falsely low platelet count- laboratory will check a blood film and ask for citrated (Coag) sample to attempt an accurate measurement of the platelets
CSF	Contaminated with red cells	• Would process-appropriate comment will be added
Bone marrow smears	Not enough marrow material to perform stains on	• Could not perform stains-repeats would be requested
BLOOD TRANSFUSION		
X-Match Samples & Grouping Samples	Extreme Haemolysis	• Would not use- repeats will be requested
Grouping Sample	Clotted Sample	• Would not process
Samples for Cold Agglutinins	Sent to the lab 'cold' i.e. not in warm water	• Would not process
HAEMATINICS and HAEMOLYTICS		
Red Cell Folate	No EDTA sample Sent- only clotted sample	• Only serum folate can be measured
Red Cell Folate	EDTA clotted	• Would not process
Ferritin , B12, Serum folate	Only EDTA sent	• Would not process
Haematinic assays	Haemolysis	• Would process and add appropriate comment
Haemolytic assays	EDTA clotted	• Would not process
Plasma Viscosity	Sample stored in fridge	• Would not process

This list is not exhaustive-there may be other factors affecting the reporting of results which are not listed

Maximum Surgical Blood Order Schedule (MSBOS)

http://staffnet.cmft.nhs.uk/Policies/Transfusion/Maximum%20Blood%20Order%20Schedules%20doc%20July.pdf

When blood is available for a placenta praevia case, an antibody screen sample is required on Mondays and Thursdays.

All other major surgical procedures will be a 'Group and Save' unless discussed with Blood Transfusion staff beforehand on Extension 4400 or Bleep 2525 Out of Hours. **If a particular case requires more than the amount indicated on the schedule you must contact the laboratory personnel on extension 4400 or bleep 2525 out of hours.**

Remember to obtain positive patient identification when taking blood samples. Good documentation is essential. Include on request forms any special requirements e.g. irradiated, previous transfusion history, reason for request and when the blood is required.

NB. In the interest of patient safety, all unused units of blood in the Blood Satellite Fridges **MUST be** returned to the Transfusion Laboratory within **48 hours**.